Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL GUIDELINE CLEARINGHOUSE

General

Guideline Title

Hand, wrist, and forearm disorders, not including carpal tunnel syndrome.

Bibliographic Source(s)

Hand, wrist, and forearm disorders not including carpal tunnel syndrome. In: Hegmann KT, editor(s). Occupational medicine practice guidelines. Evaluation and management of common health problems and functional recovery in workers. 3rd ed. Elk Grove Village (IL): American College of Occupational and Environmental Medicine (ACOEM); 2011. p. 1-188.

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Forearm, wrist, and hand complaints. Elk Grove Village (IL): American College of Occupational and Environmental Medicine (ACOEM); 2004. 34 p.

Regulatory Alert

FDA Warning/Regulatory Alert

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- March 22, 2016 – Opioid pain medicines : The U.S. Food and Drug Administration (FDA) is warning about several safety issues with the entire class of opioid pain medicines. These safety risks are potentially harmful interactions with numerous other medications, problems with the adrenal glands, and decreased sex hormone levels. They are requiring changes to the labels of all opioid drugs to warn about these risks.

Recommendations

Major Recommendations

Definitions for the strength of evidence ratings (A, B, C, and I) and the criteria for evidence-based recommendations are presented at the end of the "Major Recommendations" field.

General Approach and Basic Principles

The principal recommendations for assessing and treating patients with acute, subacute, or chronic hand, wrist, or forearm symptoms are as follows:

- The initial assessment focuses on detecting indicators of potentially serious disease, termed red flags (see Table 8 in the original guideline document), which require urgent assessment and treatment as indicated.
- The foci for treatment of patients with hand, wrist, or forearm symptoms include optimal medical care, monitoring for complications, facilitating the healing process, assisting stay at work or early return to work in a modified or full-duty capacity, and include surgical intervention(s) when indicated.
- Relieving discomfort can frequently and most safely be accomplished by modifying activities and using either topical or systemic non-prescription analgesics.
- Encourage patients recovering from hand, wrist, or forearm problems to stay at work or consider early return to modified work as their condition permits.
- Address occupational factors where the disorder is believed to be caused by work.
- Address non-physical factors (e.g., psychosocial, workplace, or socioeconomic problems) in an effort to resolve delayed recovery.

This guideline addresses the following hand, wrist, and forearm disorders which may present to the health care provider.

Summary Tables: Recommendations and Evidence

Table 1 is a summary of the recommendations from the Evidence-based Practice Hand, Wrist, and Forearm Panel for diagnostic testing for hand, wrist, or forearm disorders. Table 2 is a summary of recommendations for managing these disorders. Table 3 is a summary of ergonomic recommendations related to these disorders and Table 4 is a summary of post-operative rehabilitation recommendations related to these disorders. The recommendations are based on critically appraised higher quality research evidence and on expert consensus observing First Principles when higher quality evidence was unavailable or inconsistent. The reader is cautioned to utilize the more detailed indications, specific appropriate diagnoses, temporal sequencing, prior testing or treatment, and contraindications that are elaborated in more detail for each test or treatment in the body of this Guideline in using these recommendations in clinical practice or medical management. These recommendations are not simple "yes/no" criteria, and the evidence supporting them is in nearly all circumstances developed from typical patients, not unusual situations or exceptions.

Recommendations are made under the following categories:

- Strongly Recommended, "A" Level
- Moderately Recommended, "B" Level
- Recommended, "C" Level
- Insufficient-Recommended (Consensus-based), "I" Level
- Insufficient-No Recommendation (Consensus-based), "I" Level
- Insufficient-Not Recommended (Consensus-based), "I" Level
- Not Recommended, "C" Level
- Moderately Not Recommended, "B" Level
- Strongly Not Recommended, "A" Level

Table 1. Summary of Recommendations for Diagnostic and Other Testing for Hand, Wrist, or Forearm Disorders

Test	Recommendation(s)
Electrodiagnostic Studies (EDS)	Quality electrodiagnostic studies to assist in securing a firm diagnosis for those patients without a clear diagnosis – Recommended, Evidence (C) Electrodiagnostic testing to confirm clinical suspicion of ulnar nerve entrapment at the wrist – Recommended, Insufficient Evidence (I) Electrodiagnostic testing to confirm clinical suspicion of a radial motor neuropathy – Recommended, Insufficient Evidence (I) Electrodiagnostic studies for the evaluation of patients with paresthesias or other neurological symptoms – Recommended, Insufficient Evidence (I) Nerve conduction velocity studies to diagnose hand arm vibration syndrome – No Recommendation, Insufficient Evidence

Test	Recommendation(s)
Ultrasound	Ultrasound to diagnose mallet finger – Not Recommended, Insufficient Evidence (I) Ultrasound to diagnose ulnar nerve entrapment at the wrist – No Recommendation, Insufficient Evidence (I) Ultrasound for diagnosing tuft fractures – Not Recommended, Insufficient Evidence (I) Ultrasound for diagnosing phalangeal and metacarpal fractures – Not Recommended, Insufficient Evidence (I) Ultrasound for the evaluation of chronic wrist pain with suspected occult dorsal or volar wrist ganglia. It may be beneficial in select cases in deciding on the course of treatment. – No Recommendation, Insufficient Evidence (I) Ultrasound for evaluating suspected radiolucent materials or as an alternative test when radiopaque foreign body is suspected but not detected on x-ray images – Recommended, Insufficient Evidence (I)
Magnetic Resonance Imaging (MRI)	MRI to diagnose triangular fibrocartilage complex (TFCC) tears – Recommended, Insufficient Evidence (I) MRI for follow-up of select patients with crush injuries or compartment syndrome – Recommended, Insufficient Evidence (I) MRI to diagnose Kienböck disease – Recommended, Insufficient Evidence (I) MRI to diagnose ulnar nerve entrapment at the wrist – No Recommendation, Insufficient Evidence (I) MRI for diagnosis of occult scaphoid fracture when clinical suspicion remains high despite negative x-rays – Recommended, Evidence (C) MRI for diagnosing tuft fractures – Not Recommended, Insufficient Evidence (I) MRI for diagnosing phalangeal and metacarpal fractures – Not Recommended, Insufficient Evidence (I) MRI to diagnose suspected soft-tissue trauma after x-ray images confirm a complex displaced, unstable, or comminuted distal forearm fracture – Recommended, Insufficient Evidence (I) MRI for the evaluation of wrist pain with suspected occult dorsal or volar wrist ganglia – No Recommendation, Insufficient Evidence (I)
MR Arthrography	MR arthrography to diagnose TFCC tears – Recommended, Insufficient Evidence (I) MR arthrography for patients without improvement in wrist sprains after approximately 6 weeks of treatment – Recommended, Insufficient Evidence (I)
Computerized Tomography (CT)	CT for follow-up of select patients with crush injuries or compartment syndrome – Recommended, Insufficient Evidence (I) CT to diagnose ulnar nerve entrapment at the wrist if a hook of the hamate fracture is suspected based upon the history, a mechanism of potential fracture, focal pain at the hamate and where there are ulnar nerve symptoms – Recommended, Insufficient Evidence (I) CT imaging to diagnose occult scaphoid fracture when clinical suspicion remains high despite negative x-rays – Recommended, Insufficient Evidence (I) CT for diagnosing tuft fractures – Not Recommended, Insufficient Evidence (I) CT for diagnosing phalangeal and metacarpal fractures – Not Recommended, Insufficient Evidence (I) CT for investigation of occult and complex distal forearm fractures to gain greater clarity of fracture displacement, articular involvement, and subluxation of the distal radioulnar joint – Recommended, Insufficient Evidence (I) CT for evaluating suspected superficial foreign bodies. CT is not routinely recommended, but may be indicated for the

Test	Recommendation(s)
	evaluation of suspected radiolucent materials and as an alternative test when radiopaque foreign body is suspected but is not detected on x-ray images or ultrasound. – No Recommendation, Insufficient Evidence (I)
X-rays	X-rays to diagnose TFCC tears – Recommended, Insufficient Evidence (I) X-rays for patients with crush injuries or compartment syndrome – Recommended, Insufficient Evidence (I) X-rays to diagnose Kienböck disease – Recommended, Insufficient Evidence (I) X-rays for wrist sprains to determine whether a fracture is present, particularly for patients with scaphoid pain or scaphoid tubercle tenderness – Recommended, Insufficient Evidence (I) X-rays in most cases of mallet finger to determine if a fracture is present and to what extent – Recommended, Insufficient Evidence (I) X-rays for evaluation of cases in which non-specific hand, wrist, or forearm pain persists – Recommended, Insufficient Evidence (I) X-rays for scaphoid fracture for diagnostic purposes that include at least three to four views including a "scaphoid view" – Recommended, Insufficient Evidence (I) Follow-up x-rays in two weeks for evaluation of potential scaphoid fracture, particularly for patients with a high clinical suspicion of fracture, but negative initial x-rays – Recommended, Insufficient Evidence (I) X-rays to diagnose tuft fractures – Recommended, Insufficient Evidence (I) X-rays for diagnosing phalangeal or metacarpal fractures and should include three projections, including posteroanterior, lateral, and oblique view. A true lateral projection isolating the involved digit is required. – Recommended, Insufficient Evidence (I) Routine x-rays for follow-up of non-operative treatment of 5th metacarpal fractures – Not Recommended, Insufficient Evidence (I) X-rays for follow-up of all metacarpal fractures are reasonable; however, fractures at risk for displacement after reduction are particularly recommended to have repeat radiographic studies 7 to 10 days after injury to ensure no further displacement or malrotation has occurred. – Recommended, Insufficient Evidence (I) X-rays in the posteroanterior and lateral views as a first-line study for suspected distal forearm fracture – Recommended, Insufficient Evidence (I) X-rays to diagnose dorsal or volar wrist ganglia in select patients – Recommended, Insufficient Evidence (I) Routine use of x-rays to evaluate dorsal or volar wrist ganglia – Not Recommended, Insufficient Evidence (I) X-rays for the evaluation of traumatic injury resulting in skin lacerations to rule out fracture or if a radiopaque foreign body is suspected – Recommended, Insufficient Evidence (I) X-rays to define objective evidence of the extent of hand/finger osteoarthrosis – Recommended, Insufficient Evidence (I)
Rheumatological Studies and Arthrocentesis	Rheumatological studies for evaluation of patients with persistent, unexplained arthralgias or tenosynovitis – Recommended, Insufficient Evidence (I) Arthrocentesis (joint aspiration) of inexplicable joint effusions, particularly for evaluation of infections and crystalline arthropathies – Recommended, Insufficient Evidence (I)
Screening for Systemic Diseases	Screening for systemic disorders for patients with Kienböck disease – Recommended, Insufficient Evidence (I)
Bone Scans	Bone scanning to diagnose occult scaphoid fracture when clinical suspicion remains high despite negative x-rays – Recommended, Insufficient Evidence (I)

Test	Recommendation(s)
	Bone scanning for diagnosing tuft fractures – Not Recommended, Insufficient Evidence (I)
	Bone scanning for diagnosing phalangeal and metacarpal fractures – Not Recommended, Insufficient Evidence (I)
Cold Provocation Test	Cold provocation test to diagnose hand arm vibration syndrome – No Recommendation, Insufficient Evidence (I)
Cold Stress Thermography	Cold stress thermography (finger skin temperature, infrared, dynamic infrared, laser Doppler imaging) to diagnose hand arm vibration syndrome – No Recommendation, Insufficient Evidence (I)
Finger Systolic Blood Pressure	Finger systolic blood pressure to diagnose hand arm vibration syndrome – No Recommendation, Insufficient Evidence (I)
Vibrotactile Threshold Testing	Vibrotactile threshold testing to diagnose hand arm vibration syndrome – No Recommendation, Insufficient Evidence (I)
Thermal Aesthesiometry	Thermal aesthesiometry to diagnose hand arm vibration syndrome – No Recommendation, Insufficient Evidence (I)
Serologic Tests	Serologic tests – thrombomodulin, soluble intracellular adhesion molecule 1 (s1-CAM 1) – to diagnose hand arm vibration syndrome – Not Recommended, Insufficient Evidence (I)
Connective Tissue Disorder Testing	Testing for connective tissue disorders to diagnose hand arm vibration syndrome – No Recommendation, Insufficient Evidence (I)
Wound Culture	Routine culture and sensitivity of animal and human bite wounds – Moderately Not Recommended, Evidence (B)

Table 2. Summary of Recommendations for Managing Hand, Wrist, or Forearm Disorders

Disorder	Treatment with Evidence Rating/Recommendation Level		
	Recommended	No Recommendation	Not Recommended
Triangular Fibrocartilage Complex (TFCC) Tears	Education for select patients (I) Relative rest for acute, subacute, or chronic TFCC tears (I) Splinting for moderate or severe acute or subacute TFCC tears, particularly to reduce forearm rotation (I) Self-application of ice for acute, subacute, or chronic TFCC tears (I) Self-application of heat for acute, subacute, or chronic TFCC tears (I) Non-steroidal anti-inflammatory drugs (NSAIDs) or acetaminophen to control pain associated with acute, subacute, or chronic TFCC tears, particularly for patients with significant pain (I) Surgical repair (arthroscopic or open) for patients with		

Disorder	Treatment with Evidence Rating/Recommendation Level		
	Recommended	No Recommendation	Not Recommended
	instability, concomitant fractures, or symptoms that persist without trending towards resolution despite non-operative treatment and the passage of approximately 3 to 6 weeks (I) Ulna shortening and wafer procedures for select cases of chronic Types IIC and IID tears for which non-surgical treatment is unsuccessful and there is demonstrable ulna positive variance (I)		
Crush Injuries or Compartment Syndrome	Elevation and rest for acute crush injuries or compartment syndrome (I) Splinting after initial treatment for moderate or severe acute and subacute crush injuries or compartment syndrome (I) Self-application of ice for acute crush injuries or compartment syndrome. Other cryotherapies may be required in hospital settings for more severe cases. (I) NSAIDs and acetaminophen to control pain associated with acute or subacute crush injuries or compartment syndrome (I) Opioids for select patients with pain due to moderate or severe, acute or subacute crush injuries or compartment syndrome (I) Hyperbaric oxygen for acute or subacute crush injuries or compartment syndrome depending on the nature of the injury. This frequently includes emergency fasciotomy for release of tension from compartment syndrome as well as other surgical procedures to address fractures and other remediable defects. (C) Surgery for acute or subacute crush injuries or compartment syndrome depending on the nature of the injury. This frequently includes emergency fasciotomy for release of tension from compartment syndrome as well as other surgical procedures to address fractures and other remediable defects. (I)		Self-application of heat for acute crush injuries or compartment syndrome (I)
Kienböck Disease	Education for select patients (I) Self-application of ice for acute, subacute, or chronic Kienböck disease (I) Self-application of heat for acute, subacute, or chronic Kienböck disease (I) Splints for select patients with acute, subacute, or chronic Kienböck disease (I) NSAIDs or acetaminophen to control pain associated with acute, subacute, or chronic Kienböck disease (I) Topical medications, including topical creams, ointments,		

Disorder	Treatment with Evidence Rating/Recommendation Level		
	Recommended	No Recommendation	Not Recommended
	and lidocaine patches for acute, subacute, or chronic Kienböck disease (I) Judicious use of opioids for pain management for select patients with chronic moderate to severe Kienböck disease (I) Surgical treatment as an option for patients with moderate to marked impairment if not improved 8 weeks post-injury or after 6 weeks of non-operative treatment due to Kienböck disease (I)		
Wrist Sprains	Education for select patients (I) Relative rest for acute wrist sprains (I) Splinting for moderate or severe acute or subacute wrist sprains (I) Self-application of ice for acute wrist sprain (I) Self-application of heat for acute wrist sprain (C) NSAIDs to control pain associated with acute or subacute wrist sprain (C) Acetaminophen to control pain associated with acute or subacute wrist sprain (I) Opioids for nocturnal use for select patients with severe acute or subacute wrist sprain pain (I)		Surgery for acute or subacute wrist sprain in the absence of a remediable defect (I)
Mallet Finger	Education for select patients (I) Extension splinting with joint in neutral or hyperextended position for acute or subacute mallet finger (B) Provide careful instructions on splint wear to patients (I) Surgical treatment with a fixation wire for patients with displaced fractures involving more than 1/3 to 1/2 of the articular surface of the distal interphalangeal (DIP) joint (I) Surgery for those cases that fail splinting yet have sufficient symptoms or concerns than an attempt at fixation is desired (I)		
Flexor Tendon Entrapment (Tenosynovitis and Trigger Digit)	Education for select patients (I) Splints for select cases (i.e., patients who decline injection) of acute, subacute, or chronic flexor tendon entrapment (I) Glucocorticosteroid injections for acute, subacute, or chronic flexor tendon entrapment (A) Open release for persistent or chronic flexor tendon entrapment. Percutaneous release is a reasonable option. (B)		
Extensor	Removal from job tasks thought to have caused extensor	Other non-operative treatments	

Disorder	Treatment with Evidence Rating/Recommendation Level		
Compartment Tenosynovitis (including de Quervain's Stenosing Tenosynovitis and Intersection Syndrome)	compartment tenosynovitis (I) Recommended Education for select patients (I) Thumb spica splints for acute and subacute thumb extensor compartment tendinoses, and non-spica wrist splints for other extensor compartment tendinoses (I) NSAIDs (oral or topical) to control pain associated with acute, subacute, or chronic extensor compartment tenosynovitis (C) Iontophoresis treatments using glucocorticosteroids and sometimes NSAIDs (I) Glucocorticosteroid injections for acute, subacute, or chronic de Quervain's or other wrist compartment tendinosis (C) Surgical release for patients with subacute or chronic extensor compartment tenosynovitis who fail to respond to injection (I)	(i.e., manipulation and mobilization, massage, deep friction massage, and acupuncture) for acute, subacute, or chronic extensor compartment tenosynovitis (I) No Recommendation	Not Recommended
Ulnar Nerve Entrapment at the Wrist (including Guyon's Canal Syndrome and Hypothenar Hammer Syndrome)	Removal from job tasks thought to have caused ulnar neuropathy at the wrist (I) Education for select patients (I) Activity modification, with particular avoidance of significant localized mechanical compression of the nerve or use of the hand as a hammer for ulnar nerve compression at the wrist (I) Neutral wrist splinting as a first-line treatment for acute, subacute, or chronic ulnar nerve compression at the wrist (I) Surgical decompression for subacute or chronic ulnar nerve compression at wrist after failure of non-operative treatment if space-occupying lesions are present (I)	NSAIDs to control pain associated with acute, subacute, or chronic ulnar nerve compression at the wrist (I) Oral and injected glucocorticosteroids for acute, subacute, or chronic ulnar nerve compression at the wrist (I) Physical methods/rehabilitation (i.e., iontophoresis, self-application of ice and heat, manipulation and mobilization, massage, friction massage, and acupuncture) for acute, subacute, or chronic ulnar neuropathy at the wrist (I)	
Radial Nerve Entrapment	Removal from job tasks thought to have caused radial neuropathy at the wrist (I) Education for select patients (I) Wrist extension or thumb spica splint for acute, subacute, or chronic radial nerve neuropathy (I) Surgical release for subacute or chronic cases of radial nerve compression neuropathy that persist despite other interventions (I)	NSAIDs to control pain associated with acute, subacute, or chronic radial nerve compression neuropathy (I) Oral or injected glucocorticosteroids for acute, subacute, or chronic radial nerve compression at the wrist (I) Physical methods/rehabilitation (i.e., iontophoresis, self-application of ice and heat, manipulation and mobilization, massage, friction massage, and acupuncture) for acute, subacute, or chronic radial neuropathy at the wrist (I)	

Disorder	Treatment with Evidence Rating/Recommendation Level		
Non-Specific Hand/Wrist/Forearm Pain	Education for select patients (I) Relative rest for select cases of acute non-specific hand, wrist, or forearm pain, particularly where there are high ergonomic exposures (high force, or high force combined with other risk factors) (I) Self-application of ice or heat for acute or subacute non-specific hand, wrist, or forearm pain (I) NSAIDs for control of pain associated with acute or subacute non-specific hand, wrist, or forearm pain (C) Acetaminophen for control of pain associated with acute or subacute non-specific hand, wrist, or forearm pain (I)	Splinting for acute or subacute non-specific hand, wrist, or forearm pain (I) Physical or occupational therapy for acute, subacute, or chronic non-specific hand, wrist, or forearm pain (I)	Opioids for control of pain associated with acute, subacute, or chronic non-specific hand, wrist, or forearm pain (I)
Scaphoid Fracture	Education for select patients (I) Referral of select patients needing education after cast removal for scaphoid fracture (I) Wrist splinting for scaphoid tubercle fractures (I) Immobilization of the wrist with casting for documented stable scaphoid fractures which are displaced less than 1 mm, are non-oblique, and do not include the proximal 1/3 of the scaphoid (B) Colles' casting or supportive bandaging for patients with suspicion of scaphoid fracture, but with negative x-rays (I) Long-arm casting at 90° of elbow flexion for high-risk scaphoid fractures that are displaced 1mm or more or fractures of the proximal 1/3 of scaphoid and oblique fractures. It is recommended that high-risk scaphoid fractures be evaluated and treated by a specialist experienced in management of these fractures. (I) NSAIDs or acetaminophen to control pain associated with scaphoid fractures (I) Referral of select patients needing education after cast removal (I) Referral of patients with functional debilities or those unable to return to work for physical or occupational therapy after cast removal (I) Surgical fixation of displaced scaphoid fractures (I) Surgical intervention of non-displaced or minimally displaced scaphoid fracture for patients requiring earlier functional recovery (C)	Concurrent immobilization of the thumb with the wrist (I) Ultrasound to accelerate bone graft healing (I) Osteogenic protein-1 for adjuvant treatment with bone grafting (I)	Surgical intervention of non-displaced scaphoid fractures for all other patients (C) Routine referral for physical or occupational therapy after cast removal for scaphoid fracture of otherwise healthy patients who are able to return to work (I)
Distal Phalanx Fractures and Subungual Hematoma	Education for select patients (I) Trephination for the management of subungual hematoma (I) NSAIDs or acetaminophen to control pain associated with	Post-trephination antibiotic prophylaxis for open fractures (I) Routine use of physical or occupational therapy for tuft	Nail removal or laceration repair for the management of subungual

Disorder	Treatment with Evidence Rating/Recommendation Level		
	tuft fractures (I) For open fractures, tetanus immunization status should be updated as necessary (I)	fractures (I) No Recommendation	hematoma (I) Not Recommended
	Protective splinting of the distal phalanx to the PIP (I)		Tight circumferential taping around the fingertip for tuft fractures (I)
Middle and Proximal Phalangeal and Metacarpal Fractures	Education for select patients (I) Ring block technique, followed by volar subcutaneous block, for digital anesthesia, as it provides more effective coverage of dorsal phalangeal injuries than the other techniques (B) NSAIDs or acetaminophen to control pain from phalangeal or metacarpal fractures (I) For open fractures, tetanus immunization status should be updated as necessary (I) Immobilization for middle and proximal phalanx fractures (I) Non-operative management (immobilization) for non-displaced and stable transverse diaphyseal fractures of the middle and proximal phalanges (I) Non-operative management of non-displaced oblique fractures of the middle and proximal phalanges as these fractures are usually stable and require rigid immobilization alone (I) Closed reduction with splinting for base phalanx fractures (I) Surgical management of condylar fractures as these fractures are unstable (I) Surgical management for malrotated phalangeal fractures as deformity and impairment may result (I) Non-operative treatment of distal metacarpal head fractures using closed reduction and protective immobilization with radial or ulnar gutter splint for fractures with less than 20% of joint involvement (I) Non-operative treatment of distal metacarpal head fracture using angulation (I) Non-operative treatment before surgical treatment for most 5th metacarpal neck fractures as the outcomes are similar both functionally and anatomically (I) Use of functional therapies including taping, functional bracing, and strapping over casting or ulnar splinting for 5th metacarpal neck fracture (B) Surgical management of base fractures of the proximal metacarpal as these fractures are rarely stable and require	Antibiotic prophylaxis for open phalangeal fractures (I) Non-operative management of metacarpal shaft fractures (I)	

Disorder	Treatment with Evidence Rating/Recommendation Level		
	Recommended	No Recommendation	Not Recommended
	percutaneous pins or screws to maintain reduction (I) Operative fixation for metacarpal base fractures associated with dislocation (Bennett's fracture) and comminuted intraarticular fractures at the thumb base (Roland's fracture) as these fracture types are unstable (I) Surgical management for malrotated phalangeal fractures as deformity and impairment may result (I) Ice, compression, and elevation for controlling edema related to acute metacarpal fractures (I) Early mobilization of acute metacarpal fracture – before 21 days (I)		
Distal Forearm Fractures	Education for select patients (I) Referral of select patients needing education after cast removal for acute Colles' fracture (I) NSAIDs to control bone pain associated with Colles' fracture as there does not appear to be any negative effect on bone fracture union or functional recovery (C) Immobilization of non-displaced or minimally displaced distal forearm fractures limited to 3 weeks and have equivalent or superior functional outcomes than periods greater than 3 weeks for non-displaced or minimally displaced distal radius fracture (B) Use of functional bracing or splinting that will allow mobilization of the radial-carpal joint while maintaining stabilization of the fracture is moderately recommended over traditional casting to immobilize the forearm and wrist for non-displaced or minimally displaced Colles' fracture (B) Manipulation and dynamic traction devices for closed reduction technique for displaced distal radial fractures as they have demonstrated equivalent ability to achieve initial reduction of injury (C) Bier block analgesia as a first-line technique for manipulation of acute displaced distal forearm fracture (B) Hematoma block analgesia for manipulation of acute displaced distal forearm fracture (C) Dynamic reduction as an alternative technique for distal forearm fracture as it may result in less reduction pain than hematoma block, and may have a lower neurologic complication rate than hematoma block (C) Referral of patients with functional deficits or those unable to return to work for physical or occupational therapy after cast removal for acute Colles' fracture (I) Closed reduction and external fixation for severely	Casting/bracing the forearm and wrist in pronation for non-displaced or minimally displaced Colles' fracture (I) Use of a functional brace or splint that will allow mobilization of the hand while maintaining stabilization of the reduced displaced distal radial fracture (I) TFCC repair associated with distal radial fractures (I)	Use of extremely low frequency (1-1000 Hz) electromagnetic field therapy to stimulate bone healing in patients with non-displaced fractures (I) Routine referral for physical or occupational therapy after cast removal for Colles' fracture of otherwise healthy patients who are able to return to work (C)

Disorder	Treatment with Evidence Rating/Recommendation Level		
	displaced extra-articular fractures, and for comminuted displaced intraarticular fractures of the distal forearm (B) Recommended	No Recommendation	Not Recommended
	Cast immobilization for extra-articular fractures or distal forearm fractures that include moderately displaced extra-articular fractures, non-comminuted or non-displaced intra-articular fractures. External fixation is recommended as a second option for fractures that fail reduction while immobilized. (B) Medullary pinning (k-wire or intramedullary fixation techniques) as an alternative to external fixation (C) Remodelable bone cement (injected or open reduction) as an effective alternative to external fixation and casting (C) Open reduction and internal fixation by either dorsal or volar plating if fracture remains unstable by other treatment methods (I)		
Ganglion Cyst	Education for select patients (I) Use of non-operative management (no treatment) for acute asymptomatic wrist and hand ganglia as first-line management (I) Aspiration of the cystic fluid as it may result in immediate relief of acute cosmetic and ganglia related pain (I) Surgical intervention for subacute or chronic upper extremity ganglia after a trial of non-operative management (C) No general indication for one surgical technique (arthroscopic or open excision) over another for all cases and both are recommended (C)	Addition of steroids with aspiration (I) Splinting after aspiration for acute or subacute dorsal or volar wrist ganglia as splinting may have uncertain efficacy and may lead to prolonged joint stiffness (I) Instillation of hyaluronidase into the cystic structure after aspiration (I)	Technique of multiple punctures of the cyst wall as it does not provide improved benefit over simple aspiration (I) Use of sclerosing agents such as phenol and hypertonic saline, which when instilled, are intended to result in scarring and closure of the cystic potential space (I)
Hand Arm Vibration Syndrome (HAVS)	Work be restricted to tasks that do not involve high-amplitude, low frequency vibration exposure from hand-held tools (I) Work be restricted to tasks that do not involve cold exposures for select patients with HAVS (I) Education for select patients (I) Calcium channel blockers (nifedipine) for vascular symptoms similar to Raynaud's phenomenon for advanced subacute or chronic HAVS (I)		
Laceration	Education for select patients (I)	Use of semi-occlusive or occlusive	Routine

Management Disorder	Treatment with Evidence Rating/Recommendation Level		
	Recommended	No Recommendation	Not Recommended
	Meticulous wound preparation after appropriate anesthesia using saline irrigation or copious amounts of running tap water, scrubbing, and debridement of devitalized tissue (I) Use of either sterile saline or tap water for an irrigating solution (C) Use of either sterile or clean gloves during wound cleaning (C) Adequate anesthesia by either topical anesthetic plus local infiltration or digital block is moderately recommended for finger laceration repair. There is no recommendation of one technique over the other. For distal finger lacerations, digital block may be substantially less painful than local infiltration performed without topical anesthetic. If the operator and patient preference is digital block, the various techniques are described and evaluated in the management of phalangeal fracture section in this chapter. (B) Instillation of local anesthetic for extremity wounds after sensory testing is recommended as the first-line technique for most laceration repairs unless the size or complexity would require potentially toxic doses of local anesthetic. Local anesthetic with epinephrine (except digits) is recommended. (I) Use of topical anesthetics, tetracaine-adrenaline-cocaine (TAC) and lidocaine/prilocaine (EMLA), is recommended as an alternative to local infiltration for lacerations of the extremities (excluding digits) or as pre-treatment to reduce pain related to needle infiltration. However, these anesthetics have longer times to onset of effective anesthesia. (C) Non-complicated linear lacerations of the hand less than 2 cm should be managed without suturing by healing via secondary intention for some workers. Wounds should be carefully selected, not have tension, including not overlying or near joints and not have tension applied due to manual labor. (C) Immediate referral to a surgeon if the laceration shows evidence of a nerve injury (I) Suture repair for lacerations of hand or forearm. No recommendations for one technique over another or for one suture material type over another. (B) Tissue adhesives, staples and surgical tape for routine skin repair of non-complicated extremity lacerations within the limitations of repair strength equivalent to 5-0 suture material or higher (B) Complicated wounds repaired with sutures or staples and heavily contaminated or infected at initial presentation	dressing of the wound. The use of semi-occlusive dressings is commonly used although there is little evidence that this practice improves infection rate or cosmetic outcomes. Dressings may be more indicated based on potential contamination at work or other workplace exposures. (I) Use of topical antimicrobials (I)	antibiotic prophylaxis for uncomplicated hand and forearm lacerations (C)

Disorder	Treatment with Evidence Rating/Recommendation Level		
	Recommended	No Recommendation	Not Recommended
	should be closely followed-up within 24 to 72 hours and at suture removal (I) NSAIDs or acetaminophen to control pain associated with upper extremity postlaceration repair (I) Occasionally short courses of opioid medications to control pain associated with upper extremity post-laceration repair (I)		
Human and Animal Bites and Associated Lacerations	Education for select patients (I) Exposures that could be considered high risk for viral blood borne pathogen transmission should be evaluated and treated according to blood borne pathogen protocols (I) Prophylactic antibiotic treatment for complicated dog bite wounds, particularly those with delayed irrigation, delayed treatment, involvement of tendon, tendon sheath, crush injuries, or moderate- to large-size tears (I) Prophylactic antibiotics for uncomplicated human bite wounds (C) Prophylactic antibiotics for uncomplicated cat bite wounds (I) Suturing of non-complicated dog bite wounds after adequate wound care as it may lead to a better cosmetic result and is not likely to result in increased wound infections over wounds allowed to heal by secondary intent (I)		Prophylaxis for uncomplicated dog bite wounds that receive adequate wound care including irrigation, debridement, and cleansing (B)
Hand/Finger Osteoarthrosis	Education for select patients (I) Splinting for acute flares or chronic hand osteoarthrosis (C) Exercise for chronic hand osteoarthrosis (C) Self-application of heat for acute flares or chronic hand osteoarthrosis (I) NSAIDs to control pain associated with acute flares, subacute, or chronic hand osteoarthrosis (C) Acetaminophen (or the analog, paracetamol) may be a reasonable alternative for treatment of osteoarthosis pain (C), although quality evidence documents these are consistently less efficacious in comparison with NSAIDs (A) Patients with greater risk should be considered for treatment with either acetaminophen, NSAID plus misoprostol, proton pump inhibitors or a cyclooxygenase-2 (COX-2) selective agent (A) Concomitant prescriptions of cytoprotective medications	Use of one NSAID over another or use of enteric-coated vs. sustained release preparations (I) Use of glucosamine, chondroitin sulfate, methyl-sulfonyl methane, diacerein (diacerhein, diacetylrhein), harpagophytum, avocado soybean unsaponifiables, ginger, oral enzymes, nettle leaf, or rose hips for chronic hand osteoarthrosis or acute flares (I) Prolotherapy injections for subacute or chronic hand osteoarthrosis (I)	Relative rest (I) Self-application of ice (I) Routine use of opioids for pain associated with acute flares or subacute hand osteoarthrosis (C) Low-level laser therapy (B) Trapeziectomy with ligament reconstruction and tendon interposition (LRTI) for thumb carpometacarpal

Disorder	Treatment with Evidence Rating/Recommendation Level		
	for patients at substantially increased risk for gastrointestinal bleeding (A) Recommended	No Recommendation	(CMC) joint osteoarthritis (C) Not Recommended
	Patients with known cardiovascular disease or multiple risk factors for cardiovascular disease should have the risks and benefits of NSAID therapy for pain discussed (I) Acetaminophen or aspirin as first-line therapy for patients with known or multiple risk factors for cardiovascular disease (A) Acetaminophen to control pain associated with acute flares, subacute, or chronic hand osteoarthrosis, particularly for patients with contraindications for NSAIDs (I) Topical NSAIDs to control pain associated with hand osteoarthrosis (I) For chronic severe hand osteoarthrosis, a trial of opioid therapy may be indicated and may be required by specific intractable pain acts (I) Limited use of opioids for post-operative pain management as adjunctive therapy to more effective treatments (C) Capsaicin for chronic hand osteoarthrosis or acute flares of osteoarthrosis (C) Yoga for chronic hand osteoarthrosis or acute flares of osteoarthrosis (I) Intraarticular injections for subacute or chronic hand osteoarthrosis (C) Intraarticular hyaluronate injections for subacute or chronic hand osteoarthrosis (C) Reconstructive surgery for select patients with trapeziometacarpal arthrosis (C) Fusion for select patients (I)		

Table 3. Summary of Recommendations for Ergonomic Interventions for Distal Upper Extremity Musculoskeletal Disorders with an Occupational Basis and Return-to-Work Programs

Recommended	No Recommendation	Not Recommended
Ergonomic interventions in settings with combinations of risk factors (e.g., high force combined with high repetition) to reduce risk factors for common distal upper extremity tendinosis (I) Use of alternate or split keyboards among select patients with common distal upper extremity tendinosis (I) Forearm support for frequent keyboard users for potential prevention of neck and/or shoulder symptoms (C)	Ergonomics training for prevention of musculoskeletal disorders in office settings (I)	Mandating typing in a 90° traditional posture for prevention of distal upper extremity tendinosis (C) Mandating typing in a 90° traditional posture for treatment of distal upper extremity tendinosis (I) Return-to-work programs for

Recommended	No Recommendation	Not Recommended
Computer typing breaks for select patients with other common extensor and flexor hand/wrist tendinoses as well as for primary prevention (I) Ergonomics training in moderate- or high-risk manufacturing settings (I) Return-to-work programs for treatment of subacute or chronic hand, wrist, or forearm musculoskeletal disorders (MSDs), particularly patients with significant lost time (I)		treatment of acute hand, wrist, or forearm musculoskeletal disorders (I)

Table 4. Summary of Recommendations for Post-Operative Rehabilitation for Hand, Wrist, or Forearm Disorders

Recommended	No Recommendation	Not Recommended
Soft bandages (I) Splints for select patients (I) NSAIDs to control pain (B) Acetaminophen to control pain (I) Cooling blanket (I) Post-operative patients or those with functional deficits should stay as active as possible and use the hand as much as possible post-operatively or post-injury (I) Post-operative patients or those with functional deficits should perform graded, increased exercises post-operatively or post-injury. A home exercise program may accomplish this for many patients. (I) Post-operative patients should be observed particularly for failure to progress as expected, as well as for complex regional pain syndrome (see Chronic Pain chapter) or other complications, and it is recommended that there should be a low threshold for institution of formal physical or occupational therapy for rehabilitation. Patients with functional deficits should have a home exercise program with low threshold to refer to therapy for formal treatment if deficits are considerable or there is a failure to progress as expected with a home exercise program. (I)		Arnica (C)

Definitions:

Strength of Evidence Ratings

A = Strong evidence-base: Two or more high-quality studies*

B = Moderate evidence-base: At least one high-quality study or multiple moderate-quality studies** relevant to the topic and the working population

C = Limited evidence-base: At least one study of moderate-quality

I = Insufficient Evidence: Evidence is insufficient or irreconcilable

*For therapy and prevention, randomized controlled trials (RCTs) with narrow confidence intervals and minimal heterogeneity. For diagnosis and screening, cross sectional studies using independent gold standards. For prognosis, etiology or harms, prospective cohort studies with minimal heterogeneity.

**For therapy and prevention, well-conducted cohort studies. For prognosis, etiology or harms, well-conducted retrospective cohort studies or

untreated control arms of RCTs.

Recommendation	Evidence Rating	Description of Category
Strongly Recommended	A	The intervention is strongly recommended for appropriate patients. The intervention improves important health and functional outcomes based on high quality evidence, and the Evidence-Based Practice Panel (EBPP) concludes that benefits substantially outweigh harms and costs.
Moderately Recommended	B	The intervention is recommended for appropriate patients. The intervention improves important health and functional outcomes based on intermediate quality evidence that benefits substantially outweigh harms and costs.
Recommended	C	The intervention is recommended for appropriate patients. There is limited evidence that the intervention may improve important health and functional benefits.
Insufficient - Recommended (Consensus-based)	I	The intervention is recommended for appropriate patients and has nominal costs and essentially no potential for harm. The EBPP feels that the intervention constitutes best medical practice to acquire or provide information in order to best diagnose and treat a health condition and restore function in an expeditious manner. The EBPP believes based on the body of evidence, first principles, or collective experience that patients are best served by these practices, although the evidence is insufficient for an evidence-based recommendation.
Insufficient - No Recommendation (Consensus-based)	I	The evidence is insufficient to recommend for or against routinely providing the intervention. The EBPP makes no recommendation. Evidence that the intervention is effective is lacking, of poor quality, or conflicting and the balance of benefits, harms, and costs cannot be determined.
Insufficient - Not Recommended (Consensus-based)	I	The evidence is insufficient for an evidence-based recommendation. The intervention is not recommended for appropriate patients because of high costs or high potential for harm to the patient.
Not Recommended	C	Recommendation against routinely providing the intervention. The EBPP found at least intermediate evidence that harms and costs exceed benefits based on limited evidence.
Moderately Not Recommended	B	Recommendation against routinely providing the intervention to eligible patients. The EBPP found at least intermediate evidence that the intervention is ineffective, or that harms or costs outweigh benefits.
Strongly Not Recommended	A	Strong recommendation against providing the intervention to eligible patients. The EBPP found high quality evidence that the intervention is ineffective, or that harms or costs outweigh benefits.

Clinical Algorithm(s)

The following clinical algorithms are provided in the original guideline document:

- Initial evaluation of hand, wrist, or forearm disorders
- Initial and follow-up management of hand, wrist, or forearm disorders
- Evaluation of subacute or slow-to-recover patients with hand, wrist, or forearm disorders (symptoms >4 weeks)
- Surgical considerations for patients with anatomic and physiologic evidence of nerve root compression and persistent hand, wrist, or forearm symptoms
- Further management of hand, wrist, or forearm disorders
- Evaluation and management of muscle-tendon unit disorders
- Evaluation and management of other neuropathy
- Evaluation and management of non-specific acute and subacute hand, wrist, or forearm disorders
- Evaluation and management of fractures
- Evaluation and management of ganglion cysts
- Evaluation and management of hand-arm vibration syndrome (HAVS)

- Evaluation and management of lacerations and human or animal bites
- Evaluation and management of hand/finger osteoarthritis (OA)

Scope

Disease/Condition(s)

Hand, wrist, and forearm disorders, not including carpal tunnel syndrome

Guideline Category

Diagnosis

Evaluation

Management

Treatment

Clinical Specialty

Family Practice

Internal Medicine

Orthopedic Surgery

Physical Medicine and Rehabilitation

Preventive Medicine

Surgery

Intended Users

Advanced Practice Nurses

Allied Health Personnel

Health Care Providers

Occupational Therapists

Physical Therapists

Physician Assistants

Physicians

Utilization Management

Guideline Objective(s)

- To describe evidence-based best practices for key areas of occupational medical care and disability management
- To improve or restore the health of workers with occupationally related illnesses or injuries
- To improve the quality of occupational medical care and disability management

Target Population

Adults with potentially work-related hand, wrist, and forearm disorders seen in primary care settings

Interventions and Practices Considered

Diagnosis/Evaluation

1. History and physical exam
2. Electrodiagnostic studies (EDS)
3. Imaging studies (ultrasound, magnetic resonance imaging [MRI], MR arthrography, computerized tomography [CT], X-rays, bone scans)
4. Rheumatological studies and arthrocentesis
5. Screening for systemic diseases

Note: The following were considered but had no recommendation or were not recommended: cold provocation test, cold stress thermography, finger systolic blood pressure, vibrotactile threshold testing, thermal aesthesiometry, serologic tests, connective tissue disorder testing, wound culture.

Management/Treatment

1. Patient education
2. Relative rest and immobilization (splinting, casting, supportive bandaging)
3. Self-application of physical treatment (ice, heat)
4. Medication (non-steroidal anti-inflammatory drugs, analgesics, prophylactic antibiotics, calcium channel blockers, proton pump inhibitors)
5. Surgical intervention
6. Hyperbaric oxygen
7. Topical medications (topical creams, ointments, and lidocaine patches)
8. Steroid injections (steroids, intra-articular hyaluronate)
9. Work or activity restriction/modification
10. Iontophoresis
11. Activity modification
12. Wound repair
13. Referral to physical or occupational therapy
14. Activity and exercise, including yoga
15. Ergonomic interventions
16. Rehabilitation

Note: Arnica was considered but not recommended.

Major Outcomes Considered

- Symptoms of pain
- Return to work or hobby
- Need for physiotherapy

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

The following databases were searched from 1966 to 2009:

- The National Library of Medicine's MEDLARS database (Medline) (www.nlm.nih.gov)
- EBM Online (www.bmjjournals.com)
- The Cochrane Central Register of Controlled Trials (www.cochrane.org/reviews/clibintro.htm)
- TRIP Database (www.tripdatabase.com)
- CINAHL (nursing, allied health, physical therapy, occupational therapy, social services: www.cinahl.com/wpages/login.htm)
- EMBASE (www.embase.com/)
- PEDro (www.pedro.fhs.usyd.edu.au/)

Ranking and Preliminary Screening of Studies

Primary sources selected for inclusion in the evidence base for American College of Occupational and Environmental Medicine (ACOEM) products and services are limited to those with the strongest apparent study design, pending quality rating. The strength and quality of study design are determined by ranking and rating of the studies according to accepted methods. Generally accepted ranking of study design for diagnostic testing and clinical treatment methods were modified by the Guideline Methodology Committee (GMC). Systematic reviews in general are not ranked as the best design in reality, as most reviews located during pilot testing of the Methodology, with the exception of many (but not all) Cochrane reviews, did not use systematic searches or quality assessments of included studies. The GMC also excluded level 4 evidence from consideration (case series, poor-quality cohort studies, poor-quality case-control studies, expert opinion without explicit critical appraisal, and expert opinion based on physiology, bench research, first principles). The focus was on the best-designed original studies, pending quality grading. For example, studies of diagnostic tests are generally limited to those compared to an acceptable gold standard, and those reporting sensitivity and specificity. Studies of clinical treatment methods are generally limited to randomized controlled trials or crossover trials. Additional literature was also reviewed when there was a paucity of higher-grade literature or if it was brought to Evidence Based Practice Panel's (EBPP's) attention from interested parties.

To narrow the data discovered in the search to that which will be acceptable for further analysis and quality rating, researchers use additional preliminary screening criteria for original research.

Criteria for Inclusion in Study Rating and Critical Analysis of Studies of Diagnosis/Clinical Assessment Methods

1. Evaluate the efficacy (i.e., clinical accuracy) of the assessment method (i.e., the "test") in a group that contains subjects both with and without the condition the test is intended to assess.
2. Be a prospective cohort study or an arm of a randomized controlled trial (RCT).
3. Compare the findings of the assessment method (test) to an adequate reference standard for all subjects (not just subjects who tested positive).

Criteria for Inclusion in Study Rating and Critical Analysis of Studies of Treatment Efficacy

1. Evaluate a group of subjects with a representative spectrum of the clinical condition of interest.
2. Be a randomized controlled trial evaluating clinical outcomes in a group receiving the intervention compared to a comparison group receiving either no intervention or a different intervention.
3. Evaluate functional outcomes that are important to a patient's overall health or well being or are important to society.

Searches are documented, listing the database searched, the search terms, article type and limits, the time frame searched (in this case, all years in the databases), the number of studies found, the number reviewed in detail, and the number included in the systematic analysis. Despite multiple database searches, many additional studies are discovered in exhaustive manual searches of article reference lists.

Number of Source Documents

Not stated

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Strength of Evidence Ratings

A = Strong evidence-base: Two or more high-quality studies*

B = Moderate evidence-base: At least one high-quality study or multiple moderate-quality studies** relevant to the topic and the working population

C = Limited evidence-base: At least one study of moderate-quality

I = Insufficient Evidence: Evidence is insufficient or irreconcilable

*For therapy and prevention, randomized controlled trials (RCTs) with narrow confidence intervals and minimal heterogeneity. For diagnosis and screening, cross sectional studies using independent gold standards. For prognosis, etiology or harms, prospective cohort studies with minimal heterogeneity.

**For therapy and prevention, well-conducted cohort studies. For prognosis, etiology or harms, well-conducted retrospective cohort studies or untreated control arms of RCTs.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Study Assessment and Quality Rating

Studies are first abstracted into evidence tables for easier assessment. See Appendix B in the original guideline document for a sample of an evidence table for treatment studies. Each study is formally graded for quality using a modification of the most recent assessment scheme proposed by the Cochrane Collaboration Back Group, as shown in the table below. The studies are quality rated using a 0, 0.5, 1 grade for each item, where 0 = does not fulfill the requirement; 0.5 = partially fulfills the requirement and 1 = entirely fulfills the requirement. A study with a score less than 4.0 is rated as a poor-quality study; a study with a score between 4.0 and 7.5 is rated as a moderate-quality study. A study with a score of 8.0 or greater is rated as a high-quality study.

Rating Criteria for Randomized Controlled Trials of Treatment Studies

Criterion	Description
Randomization	Assessment of the degree that randomization was both reported to have been performed and successfully achieved through analyses of comparisons of variables between the treatment and control groups
Treatment allocation concealed	Concealment of the allocation of patients to various arms of the study from all involved, including patients, clinicians, and researchers
Baseline comparability	Measures how comparable the baseline groups are (e.g., age, gender, prior treatment)
Patient blinded	The patient is not aware which group he or she is in
Provider blinded	The provider is not aware which treatment he or she is delivering
Assessor blinded	The researcher is not aware which group the results apply to
Co-interventions avoided	The degree to which the study design avoided multiple interventions at the same time

Criterion	Description
Compliance acceptable	Measures the degree of noncompliance with the treatment protocol
Dropout rate	Measures the dropout rate at different periods of time
Timing of assessments	Assessments and reassessments should be performed at the same time from inception for all study groups
Analyzed by intention to treat	Whether the study data was analyzed with an "intention to treat" analysis

Methods Used to Formulate the Recommendations

Expert Consensus

Expert Consensus (Nominal Group Technique)

Description of Methods Used to Formulate the Recommendations

Each recommendation includes citations of the specific scientific literature which supports the recommendation. The recommendations explicitly consider the health benefits, side effects, and risks of the proposed recommendation. Recommendations include the data elements described in the table below.

Content of Recommendations for Diagnostic Testing or Treatment

1. The diagnoses for which the test or treatment is indicated
2. The specific indications for the test or treatment
3. The point in the time course of the problem for which it is appropriate
4. Prior conservative treatment that should be tried first
5. Relative and absolute contraindications to the test or procedure
6. The number of tests or procedures that are appropriate at a given time in the course of the problem
7. The potential benefits of the test or procedure
8. The potential harms, including effects on disability and return to work

The Evidence Based Practice Panels (EBPPs) for each topic area review and discuss draft practice recommendations from the research staff that includes a review of the quality evidence, evidence tables, and summaries. The strength of evidence rating is confirmed by the EBPP responsible for the topic, with review by the Guideline Methodology Committee (GMC). EBPP members may present additional comments related to their clinical opinions and experience for panel consideration. If a unanimous decision is not possible, an EBPP may vote on the rating of the strength of the evidence to determine a consensus. Dissenters to the consensus may draft minority opinions about the strength of evidence. In practice, this has not happened as recommendations have been unanimous.

Formulation of recommendations requires clinical judgment as well as a full evaluation and consideration of the available high-quality evidence. To aid in framing recommendations, the GMC developed a list of "First Principles" based on the Hippocratic Oath ("First Do No Harm"), medical logic, appropriate sequencing and case management, shared decision-making, support of functional recovery, and relative cost-effectiveness. The First Principles are defined in Table 7 in the original guideline document. When there is insufficient high-quality evidence of effectiveness or efficacy, or the high-quality evidence is conflicting, and to guide recommendations for alternative tests or treatments when there are several options, these principles are used to guide group decision-making.

The EBPPs then assign a Strength of Recommendation to each recommendation. If a consensus cannot be reached on the recommendation or strength of recommendation, the EBPPs may use nominal group voting if agreement is not possible in the discussion. Once a consensus is reached, the EBPPs will finalize the language and strength rating of the recommendation. If needed and material, a minority opinion can be appended to the recommendation.

Rating Scheme for the Strength of the Recommendations

Recommendation	Evidence Rating	Description of Category
Strongly Recommended	A	The intervention is strongly recommended for appropriate patients. The intervention improves important health and functional outcomes based on high quality evidence, and the Evidence-Based Practice Panel (EBPP) concludes that benefits substantially outweigh harms and costs.
Moderately Recommended	B	The intervention is recommended for appropriate patients. The intervention improves important health and functional outcomes based on intermediate quality evidence that benefits substantially outweigh harms and costs.
Recommended	C	The intervention is recommended for appropriate patients. There is limited evidence that the intervention may improve important health and functional benefits.
Insufficient - Recommended (Consensus-based)	I	The intervention is recommended for appropriate patients and has nominal costs and essentially no potential for harm. The EBPP feels that the intervention constitutes best medical practice to acquire or provide information in order to best diagnose and treat a health condition and restore function in an expeditious manner. The EBPP believes based on the body of evidence, first principles, or collective experience that patients are best served by these practices, although the evidence is insufficient for an evidence-based recommendation.
Insufficient - No Recommendation (Consensus-based)	I	The evidence is insufficient to recommend for or against routinely providing the intervention. The EBPP makes no recommendation. Evidence that the intervention is effective is lacking, of poor quality, or conflicting and the balance of benefits, harms, and costs cannot be determined.
Insufficient - Not Recommended (Consensus-based)	I	The evidence is insufficient for an evidence-based recommendation. The intervention is not recommended for appropriate patients because of high costs or high potential for harm to the patient.
Not Recommended	C	Recommendation against routinely providing the intervention. The EBPP found at least intermediate evidence that harms and costs exceed benefits based on limited evidence.
Moderately Not Recommended	B	Recommendation against routinely providing the intervention to eligible patients. The EBPP found at least intermediate evidence that the intervention is ineffective, or that harms or costs outweigh benefits.
Strongly Not Recommended	A	Strong recommendation against providing the intervention to eligible patients. The EBPP found high quality evidence that the intervention is ineffective, or that harms or costs outweigh benefits.

Cost Analysis

The guideline developers reviewed published cost analyses.

Method of Guideline Validation

Clinical Validation-Pilot Testing

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

Internal Quality Review

The Guideline Methodology Committee (GMC) assigns a committee member to each Evidence Based Practice Panel (EBPP) as a methodology

consultant to assist with adherence to this methodology. The GMC reviews all recommendations for which there are questions about consistency with the defined methodology. If the GMC determines that the approved methodology has not been followed, leading to illogical or untenable recommendations, the GMC engages in direct discussions with the EBPP to reach agreement on revision. If there is no agreement or revision, then the matter will be considered by the American College of Occupational and Environmental Medicine (ACOEM) Board of Directors when the document is submitted for Board review.

External Review

ACOEM conducts external peer review of the ACOEM *Occupational Medicine Practice Guidelines* (APGs) and periodic revisions to 1) assure that all relevant high-quality scientific literature has been found, 2) assure that the important evidence from the relevant scientific literature relevant has been accurately interpreted, 3) solicit opinions on whether the findings and recommendation statements are appropriate and consistent with the evidence, and 4) obtain general information on the conclusions and presentation of materials from external topic experts. Professional and patient organizations, as well as panel members, ACOEM Board of Directors, etc., are invited to nominate external peer reviewers.

Peer reviewers are asked to comment on the completeness of the scientific literature evaluation in their topic area, the clarity and technical accuracy of the APGs evaluation and summary of the evidence, and the appropriateness of the Guideline findings and recommendation statements.

Stakeholder Input

In a cyclical manner, ACOEM will seek stakeholder input to understand the needs and preferences of those who may utilize or be affected by the use of clinical practice guidelines in workplace settings and in the workers' compensation system. ACOEM solicits input from clinicians, health care systems, workers or patients, employers, utilization reviewers, case managers, insurers and third party administrators, attorneys, regulators, and policy makers through a variety of mechanisms. Stakeholders will be asked for comments about their experience using existing clinical practice guidelines and related products and their suggestions for future improvements. They are also asked for input on the use of clinical practice guidelines in clinical care, case management, claim administration, claim adjudication, and in the development of policies and regulations.

To ensure editorial independence in the development process, the stakeholder groups will be asked for input about the APGs, but will not be informed of panel deliberations or shown drafts of practice recommendations before the formal release of the documents. In some cases, a member of a stakeholder group may participate as a member of a Guideline EBPP or may participate in peer review or pilot testing. However, all individuals involved in the APGs development, peer review, and pilot testing are asked to keep all information about the panel's deliberations and conclusions confidential until the APGs are formally released.

Pilot Testing

The guidelines are pilot tested to determine if the recommendations are clear, easy to use, and are generally useful. Pilot testers are not asked if they think the recommendations or process for development was appropriate.

Review by the GMC and the ACOEM Board of Directors

During the entire evidence-based product development process, the GMC will work with the Panels, editors, and research staff to ensure that the evidence-based product methodology is being followed, both in the literature evaluation process and development of conclusion and recommendation statements. The Board of Directors has an opportunity to comment on the Guidelines during the external review period. Their comments are reviewed by the Panel and any necessary changes are made to the Guidelines.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

- Improved efficiency of the diagnostic process
- Effective treatment resulting in symptom alleviation and cure
- Facilitation of recovery and prevention of recurrence of distal upper extremity musculoskeletal disorders
- Return-to-work programs are thought to reduce morbidity and improve function.

Potential Harms

- Risks and complications of surgical procedures and imaging studies (e.g., infection, radiation)
- Adverse effects of medications (e.g., gastrointestinal complaints with use of acetaminophen or non-steroidal anti-inflammatory drugs)
- Ultrasound studies show a small number of false positives related to tendons or other artifacts.
- Splinting can cause skin complications.
- Two quality studies, one with 10-year follow-up, demonstrated an 11-fold increased risk of scaphotrapezial osteoarthritis in those surgically treated with internal fixation compared with those casted.

Contraindications

Contraindications

- Contraindications to amputation or replantation may include ring avulsion injuries, severely crushed or mangled parts, amputations at multiple levels, amputations in patients with other serious injuries or diseases, arteriosclerotic vessels, mentally unstable patients, distal amputations (finger tip injuries), individual finger in adult proximal to the flexor digitorum sublimis (FDS) insertion and prolonged warm ischemia.
- Attempts to use clamps to control bleeding often damage the neurovascular structures and should not be used.

Qualifying Statements

Qualifying Statements

The American College of Occupational and Environmental Medicine (ACOEM) provides this segment of guidelines for practitioners and notes that decisions to adopt particular courses of actions must be made by trained practitioners on the basis of the available resources and the particular circumstances presented by the individual patient. Accordingly, the ACOEM disclaims responsibility for any injury or damage resulting from actions taken by practitioners after considering these guidelines.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Implementation Tools

Clinical Algorithm

Mobile Device Resources

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report

Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

Hand, wrist, and forearm disorders not including carpal tunnel syndrome. In: Hegmann KT, editor(s). Occupational medicine practice guidelines. Evaluation and management of common health problems and functional recovery in workers. 3rd ed. Elk Grove Village (IL): American College of Occupational and Environmental Medicine (ACOEM); 2011. p. 1-188.

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

1997 (revised 2011)

Guideline Developer(s)

American College of Occupational and Environmental Medicine - Medical Specialty Society

Source(s) of Funding

American College of Occupational and Environmental Medicine

Guideline Committee

Evidence-based Practice Hand, Wrist, and Forearm Panel

Composition of Group That Authored the Guideline

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Panel Members: Marian C. Arbesman, PhD, OTR/L; M. Felix Freshwater, MD; Charles P. Prezzia, MD, MPH, MMM, FACOEM; David M. Rempel, MD, MPH, FACOEM, FACP; Arlen J. Rollins, DO, MSc, FACOEM, FACPM; Richard E. Sall, MD; Robert W. Watson, Jr., MD, MPH; Lyn D. Weiss, MD; Robert A. Werner, MD, MS, FAAPMR

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National, Regional, Local Committee Affiliations—Board Chair, Current Past President and Current Chairman of Nomination Committee, and Member of Ethics & Discipline Committee, American Academy of Disability Evaluating Physicians; Member of Occupational Health Committee, Program Director for Expert Witness Program, and Program Director for Occupational Orthopaedics and Workers' Compensation: A Multidisciplinary Perspective, American Academy of Orthopaedic Surgeons

Guidelines Related Professional Activities—Lead Author, Section of Musculoskeletal Upper Extremity, *AMA Guides to the Evaluation of Permanent Impairment, 6th Edition*; Member, Advisory Board, *The Medical Disability Advisor*; Member, Medical Advisory Board, *Official Disability Guidelines (ODG)*; Member, Editorial Board, ACOEM's *APG Insights*; Developer and Medical Consultant, CtdMAP (MAP Managers and PHI (Physical Health Index)

Research Grants/Other Support—None

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Guidelines Related Professional Activities— Consultant, The American Occupational Therapy Association's Evidence-based Literature Review Project; Member, Clinical Practice Committee, American College of Rehabilitation Medicine (2009)

Research Grants/Other Support—None

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Guidelines Related Professional Activities—Reviewer (on behalf of the American Association for Hand Surgery), *Occupational Medicine Practice Guidelines, 2nd Edition*, 2004; Reviewer (on behalf of ACOEM), AAOS Guidelines on Carpal Tunnel Syndrome and Distal Radius Fractures Member, Editorial Advisory Board, *Journal of Plastic Reconstructive & Aesthetic Surgery*; Member, Editorial Board, *HAND*

Research Grants/Other Support—None

Financial/Non-Financial Conflict of Interest—None

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Guidelines Related Professional Activities—Reviewer, *Occupational Medicine Practice Guidelines, 1st Edition*, 1997

Research Grants/Other Support—None

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National, Regional, Local Committee Affiliations—Member, Study Section, Safety & Occupational Health, NIH, CDC, NIOSH; Member, Physical Agents Committee, American Conference of Governmental Industrial Hygienists; Program Director, Marconi Research Conference Series; Member, Center for Occupational and Environmental Health Executive Committee, UCB/UCSF; Member, OEM Residency Advisory Committee, UCSF; Member, Committee on Faculty Welfare, Academic Senate, UCSF; Member, PhD Qualifying Exam Committees – UCB, UCSF, UCLA; Member, Ergonomics Committee, American College of Occupational and Environmental Medicine

Guidelines Related Professional Activities—Reviewer of numerous journals; Member, Editorial Board, Human Factors; Member, Editorial Board, *Applied Ergonomics*

Research Grants/Other Support—Principal Investigator, "Effect of tool design on hand pain in dental practitioners" (NIOSH); Principal Investigator, "Occupational Biomechanics (Ergonomics) Training Program" (NIOSH Northern California Educational Resource Center); Co-investigator, "Ergonomic evaluation of endoscopists" (American Society of Gastrointestinal Endoscopy); Principal Investigator, "A pooled longitudinal analysis of workplace carpal tunnel syndrome" (NIOSH)

Financial/Non-Financial Conflict of Interest—None

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National, Regional, Local Committee Affiliations—Former Board Member, International Toxic Inhalation Research Group

Guidelines Related Professional Activities—None

Research Grants/Other Support—None

Financial/Non-Financial Conflict of Interest—None

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National, Regional, Local Committee Affiliations—Member, Advisory Board, NAMCP Medical Directors Cancer Institute

Guidelines Related Professional Activities—Reviewer, ACOEM *Occupational Medicine Practice Guidelines, Second Edition*; Member, Medical Advisory Board, *The Medical Disability Advisor, Fifth Edition* (2005), and *Sixth Edition* (2009)

Research Grants/Other Support—None

Financial/Non-Financial Conflict of Interest—None

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National, Regional, Local Committee Affiliations—Vice President/Medical Director, Scientific Committee on Occupational Health and Development, HealthSpan International

Guidelines Related Professional Activities—None

Research Grants/Other Support—None

Financial/Non-Financial Conflict of Interest—None

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National, Regional, Local Committee Affiliations—Member, Board of Director's Medical and Professional Affairs Committee; Member, Krasnoff Advisory Group; Member, Performance Improvement Coordination Group; Member, EMR Implementation Team; Chair, Physician Workgroup Committee; Member, Graduate Medical Education Committee, Executive Committee of the Medical Staff, and Bylaws Committee, Nassau University Medical Center; Chairwoman and Co-Founder, Professional Women's Association, Nassau County Medical Center; Women's Liaison Officer and Member of Group on Educational Affairs, Association of American Medical Colleges

Guidelines Related Professional Activities—Self-study guide (2005) for neuromuscular rehabilitation and electrodiagnosis and rehabilitation of orthopedic and rheumatologic disorders (American Academy of Physical Medicine and Rehabilitation); Past Manuscript Reviewer, *Journal of Trauma*; Past Manuscript Reviewer, *Archives of Physical Medicine and Rehabilitation*; Past Editorial Board Member, *Clinical Pathways for Medical Rehabilitation*

Research Grants/Other Support—None

Financial/Non-Financial Conflict of Interest—None

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National, Regional, Local Committee Affiliations—Online Content Development Coordinator, American Academy of Physical Medicine and Rehabilitation; Board Member, American Board of Electrodiagnostic Medicine; Member, National VA Physical Therapy Professional Standards Board; Member, National VA Occupational Therapy Professional Standards Board; Member, Taubman Medical Library Journal Review Committee, University of Michigan; Member, Departmental Research Advisory Committee, Department of Physical Medicine and Rehabilitation, University of Michigan; Member of Clinical Executive Board and Professional Standards Board, Chair of Commodity Standards Board, and Member of Prosthetic Clinical Management Program Board, Ann Arbor Veterans Administration Medical Center

Guidelines Related Professional Activities—Member, Committee for review of Practice Parameters, American Association of Neuromuscular and Electrodiagnostic Medicine; Member, Editorial Board, *Journal of Occupational Rehabilitation*; Member, Editorial Board, *Archives of Physical Medicine and Rehabilitation*; Associate Editor, *Muscle and Nerve*; Member, Editorial Board, *Topics in Stroke Rehabilitation*; Editor, American Academy of Physical Medicine and Rehabilitation: EMG Case of the Month; Editorial Reviewer, *Clinical Neurophysiology*

Research Grants/Other Support—Principal Investigator, "Fatigue, discomfort and musculoskeletal disorders associated with standing and walking" (United Auto Workers/General Motors: Center for Health and Safety)

Financial/Non-Financial Conflict of Interest—None

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Forearm, wrist, and hand complaints. Elk Grove Village (IL): American College of Occupational and Environmental Medicine (ACOEM); 2004. 34 p.

Guideline Availability

Electronic copies: To order a subscription to APG-I, the online version of the Guidelines, call 847-818-1800 or visit http://www.acoem.org/apg-

i.aspx.

Print copies are available from the American College of Occupational and Environmental Medicine (ACOEM), 25 Northwest Point Boulevard, Suite 700, Elk Grove Village, IL 60007 by calling 847-818-1800 or order online at http://www.acoem.org/PracticeGuidelines.aspx.

Subscriptions to ACOEM's Practice Guidelines App are available for iPhone/iPod and iPad interfaces from the iTunes Web site.

Availability of Companion Documents

The following is available:

- Methodology for the update of the occupational medicine practice guidelines, 2nd edition. Elk Grove Village (IL): American College of Occupational and Environmental Medicine (ACOEM); 2008. Available from the ACOEM Web site.

Patient Resources

None available

NGC Status

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